

WEAVER
BOOS
CONSULTANTS

October 15, 2014

Mr. Ray Pilapil, Manager
Illinois Environmental Protection Agency
Bureau of Air Compliance Section #40
1021 North Grand Avenue
East Springfield, IL 62702

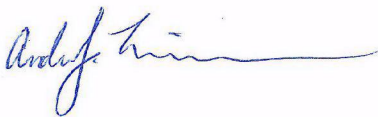
Re: 2014 Annual Compliance Test
Report Flare Performance Testing
Cottonwood Hills Recycling and Disposal Facility

Dear Mr. Palapil:

Weaver Boos Consultants, on behalf of our client, Waste Management of Illinois, Inc., is submitting the attached report of the *Open Flare Annual Test Report, Cottonwood Hills Recycling and Disposal Facility, Marissa, Illinois* dated October 2014. Please contact us at (888) 660-0346 with any questions or comments regarding this report.

Sincerely,

Weaver Boos Consultants, LLC



Andy Limmer, P.G.



David Randall, Senior Project Manager

Cc:

Ernest Dennison, P.E. – Waste Management of Illinois, Inc.
Kevin Mattison – IEPA Bureau of Air – Des Plaines Office
John Justice – IEPA Bureau of Air – Collinsville Office

**OPEN FLARE ANNUAL TEST REPORT
COTTONWOOD HILL RECYCLING AND DISPOSAL FACILITY
MARISSA, ILLINOIS**

OCTOBER 2014

Prepared For:

**Waste Management of Illinois, Inc.
601 Madison Avenue
East St. Louis, Illinois 62201**

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 FIELD ACTIVITIES	1
3.0 ANALYSIS AND RESULTS.....	2
3.1 VISIBLE EMISSIONS	2
3.2 FUEL HEATING VALUE	3
3.3 FIXED GAS ANALYSIS	4
3.4 NMOC ANALYSIS.....	4
3.5 SULFUR COMPOUNDS ANALYSIS	5
3.6 EXIT VELOCITY REQUIREMENTS - 40 CFR 60.18.....	6

APPENDICES

- Appendix A Field Logs
- Appendix B Laboratory Analytical Results
- Appendix C Calculations

**OPEN FLARE ANNUAL TEST REPORT
COTTONWOOD HILLS RECYCLING AND DISPOSAL FACILITY
MARISSA, ILLINOIS
OCTOBER 2014**

1.0 INTRODUCTION

Weaver Boos Consultants was retained by Waste Management of Illinois, Inc., to perform the 2014 annual sampling of the open flare at the Cottonwood Hills Recycling and Disposal Facility (Cottonwood Hills RDF) located in Marissa, Illinois. The flare testing was performed in accordance with the requirements of the Illinois Environmental Protection Agency (IEPA), New Source Performance Standards (NSPS), and Construction Permit No. 06100058. The subject testing was conducted on March 12, and September 03, 2014 respectively by Mr. Jacob Allen and Frank Barthol of Weaver Boos Consultants.

2.0 FIELD ACTIVITIES

The Cottonwood Hills RDF landfill gas collection and control system is routed to an open landfill gas flare. The open flare is used for the destruction of landfill gas and the control of landfill gas emissions. The flare was installed per Construction Permit No. 06100058 and began operation on February 5, 2008.

Two test events were conducted on the open flare. The test events were completed in March and September 2014. The visual test of the open flare emissions was conducted during the September 2014 event. Landfill gas samples were collected for laboratory analyses during each test event. Copies of the Cottonwood Hills RDF flare testing field logs are presented in Appendix A. Field testing information including sampling times and flare system performance data are recorded on the field logs.

Samples CWH-1, CWH-2, and CWH-3 were collected March 12, 2014 in six (6) liter, helium filled summa canisters and were analyzed per test methods ASTM D3588 and EPA Methods 25C/3C for landfill gas net heating value, nonmethane concentration, and fixed gases. Samples CWH-4, CWH-5, and CWH-6 were collected in one (1) liter Zefon bags, on the same date and were analyzed in accordance with test method ASTM D 5504 for total reduced sulfur compounds.

Three (3) samples; CWH-1, CWH-2, and CWH-3 were collected on September 03, 2014. These samples were collected in, six (6) liter stainless, silica glass lined (silonite) helium filled summa canisters and were analyzed for all the parameters detailed under the March 2014 sampling event. The landfill gas samples were collected under vacuum at the Cottonwood Hills RDF flare inlet. A calibrated flow control regulator was used to regulate the flow of landfill gas at the approximate flow rate of 100 milliliters per minute into each evacuated Summa canister. The landfill gas sample canisters were delivered under chain of custody to ALS laboratory facility in Simi Valley, California for laboratory analysis of the previously discussed parameters. Copies of the laboratory reports are presented in Appendix B.

3.0 ANALYSIS AND RESULTS

The Cottonwood Hills RDF flare testing was performed in accordance with Construction Permit No. 06100058, NSPS, and the relevant guidelines for test methods provided at 40 CFR Part 60, Appendix A. A discussion of the results is provided in the following sections.

3.1 VISIBLE EMISSIONS

Visible emissions (opacity) testing of the Cottonwood Hills RDF flare was performed on September 03, 2014 in accordance with USEPA Method 22, Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares. The visual emissions from the open flare were continuously monitored for a 2-hour timeframe and documented at 5-minute intervals. A 5-minute rest period occurred after each 20-minute observation period.

The Method 22 test results for the Cottonwood Hills RDF flare are summarized on the Method 22 Testing Field Logs presented in Appendix B. The results of the visible emissions test indicated no detectable visible emissions from the Cottonwood Hills RDF flare; therefore, the flare was operated within the maximum permitted emission limit. A summary of the acceptable Cottonwood Hills RDF flare visible emissions testing results is presented as follows.

Actual Visible Emission Event per 2 hours	Allowable Visible Emission Event per 2 hours
0 seconds	5 minutes

3.2 FUEL HEATING VALUE

Six (6) of the landfill gas samples collected during the March and September 2014 events (three samples from each event) were analyzed for net heating value by ASTM Method D3588 and fixed gases per EPA Method 3C. The results of the laboratory analyses are provided in Appendix B. The laboratory heating value analysis indicated the net heating value of the landfill gas at the time of sample collection was in compliance with the minimum requirements as described in 40 CFR 60.18(c)(3)(ii). The net heating value of the landfill gas during the test events was also calculated based on the concentration of methane in the landfill gas, in accordance with 40 CFR 60.18(f)(3) and 40 CFR 60.754(e). Per 40 CFR 60.754(e), the net heating value of combusted landfill gas is calculated from the concentration of methane in the landfill gas as measured by EPA Method 3C. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. The results of the net heating value calculation comply with the requirements of 40 CFR 60.18(c)(3)(ii) and not surprisingly are slightly less than the laboratory measured values. This is due to the fact that the calculation considers the heating value of only the methane portion of the landfill gas, while the laboratory analysis considers the heating value of all components of landfill gas contributing to the net heating value, including methane and other organic compounds. Detailed calculations are provided in Appendix C.

A summary of the laboratory results, calculated heating values and allowable heating value for the Cottonwood Hills RDF flare is presented in the following table.

Date	Sample ID	Laboratory Analytical Heating Value (MJ/scm)	Calculated Heating Value (MJ/scm)	Minimum Allowable Heating Value (MJ/scm)
03/12/2014	CWH-1	14.7	14.2	7.45
03/12/2014	CWH-2	14.8	14.4	7.45
03/12/2014	CWH-3	15.0	14.5	7.45
09/03/2014	CWH-1	16.7	16.3	7.45
09/03/2014	CWH-2	17.2	16.7	7.45
09/03/2014	CWH-3	17.1	16.6	7.45

MJ/scm: Mega joule per standard cubic meter

3.3 FIXED GAS ANALYSIS

Per the requirements of Construction Permit No. 06100058, landfill gas samples collected during the March and September 2014 events were analyzed for fixed gases, including methane and carbon monoxide, by EPA Method 3C. The results of the analysis, reported as percent by volume (%), are provided in the following table.

Date Collected	03/12/2014			09/03/2014			Average
Parameter	CWH-1	CWH-2	CWH-3	CWH-1	CWH-2	CWH-3	
Hydrogen	0.4	0.4	0.5	0.6	0.7	0.6	0.5
Oxygen+Argon	4.5	4.3	4.2	2.6	2.1	2.2	3.3
Nitrogen	20.3	19.8	19.2	13.2	11.4	11.9	16.0
Carbon Monoxide	ND	ND	ND	ND	ND	ND	ND
Methane	42.7	43.2	43.6	48.9	50.2	49.8	46.4
Carbon Dioxide	31.9	32.2	32.4	34.5	35.7	35.4	33.7

Results reported as % vol/vol ND: Not detected at or above the reporting limit

3.4 NMOC ANALYSIS

Per the requirements of Construction Permit No. 06100058, landfill gas samples collected during the March and September 2014 events were analyzed for NMOCs by EPA Method

25C. The laboratory results, reported as NMOC (as methane), were converted to NMOC (as hexane), to be consistent with the units reported under NSPS. To convert to the proper units, each NMOC (as methane) result was divided by six. The results of the NMOC (as methane) and calculated NMOC (as hexane) in the samples are summarized in the following table.

Date	Run No.	NMOC _{CH4} (ppmv)	NMOC _{C6H14} (ppmv)
03/12/2014	CWH-1	2,200	367
03/12/2014	CWH-2	2,600	433
03/12/2014	CWH-3	2,900	483
09/03/2014	CWH-1	3,200	533
09/03/2014	CWH-2	4,400	733
09/03/2014	CWH-3	4,500	750
Average		3,300	550

ppmv: parts per million by volume

3.5 SULFUR COMPOUNDS ANALYSIS

A total of six landfill gas samples collected during the March and September 2014 events were analyzed for twenty sulfur compounds, including hydrogen sulfide, by ASTM Method D 5504-08. The results of the laboratory analyses are provided in Appendix B. The average sulfur content for the samples analyzed was 414.8 ppmv. A summary of the sulfur compounds tested and their concentrations is provided on the table in table on the following page

Date collected	Units	03/12/2014			09/03/2014		
Parameter		CWH-1	CWH-2	CWH-3	CWH-1	CWH-2	CWH-3
Hydrogen Sulfide	ppbv	600,000	540,000	580,000	210,000	340,000	110,000
Carbonyl Sulfide	ppbv	1,400	1,300	1,300	850	970	820
Methyl Mercaptan	ppbv	8,200	7,400	7,900	3,900	6,100	2,900
Ethyl Mercaptan	ppbv	ND	ND	ND	ND	ND	ND
Dimethyl Sulfide	ppbv	6,000	5,700	6,500	5,700	7,000	5,000
Carbon Disulfide	ppbv	750	740	890	420	550	390
Isopropyl Mercaptan	ppbv	3,300	2,800	3,200	1,900	2,700	1,600
tert-Butyl Mercaptan	ppbv	ND	ND	ND	ND	ND	ND
n-Propyl Mercaptan	ppbv	ND	ND	ND	ND	ND	ND
Ethyl Methyl Sulfide	ppbv	ND	ND	ND	ND	ND	ND
Thiophene	ppbv	2,300	2,000	2,700	1,100	1,800	910
Isobutyl Mercaptan	ppbv	ND	ND	ND	ND	ND	ND
Diethyl Sulfide	ppbv	ND	ND	ND	ND	ND	ND
n-Butyl Mercaptan	ppbv	ND	ND	ND	ND	ND	ND
Dimethyl Disulfide	ppbv	ND	ND	ND	ND	ND	ND
3-Methylthiophene	ppbv	ND	ND	ND	ND	ND	ND
Tetrahydrothiophene	ppbv	ND	ND	ND	ND	ND	ND
2,5-Dimethylthiophene	ppbv	ND	ND	ND	ND	ND	ND
2-Ethylthiophene	ppbv	ND	ND	ND	ND	ND	ND
Diethyl Disulfide	ppbv	ND	ND	ND	ND	ND	ND
Total Per Sample	ppbv	621,950	559,940	602,490	223,870	359,120	121,620
Average	ppmv	414.8					

ppbv: parts per billion by volume ppmv: parts per million by volume

ND: Not detected at or above reporting limit

3.6 EXIT VELOCITY REQUIREMENTS - 40 CFR 60.18

As required by the air construction permit, the flare shall be designed and operated with an exit velocity per the maximum allowable as determined in 40 CFR 60.18. Basically this requires that the flare be operated with an exit velocity less than 37.2 meters per second (M/sec) and less than the maximum allowable velocity as computed by 60.18c(3)(i)(A).

In accordance with EPA Alternate Test Method 088, recorded flare flow data recorded from the flare's manufacture calibrated mass flow meter was obtained from the system's data acquisition system (DAS) during both sampling events of March and September, 2014. Based

on this data and inclusion into calculations required in the regulation the actual exit velocity during the March 12, 2014 sampling event was approximately 9.44 M/sec (31 ft/sec) and 7.51 M/sec (24.6 ft/sec) during the September 03, 2014 event. Both results are well below the initial criteria limitation of 37.2 M/sec.

As computed and demonstrated in Appendix C, the calculated V_{\max} for the permitted source, given the tested parameters was approximately 23.0 M/sec (75.6 ft/sec) for the March 2014 event and 27.2 M/sec (89 ft/sec) for the September 2014 event. As previously discussed the actual exit velocity of for each event of 9.44 M/sec (31 ft/sec) and 7.51 M/sec (24.6 ft/sec) were both well below the respective calculated maximum exit velocity.

A summary of the flare's velocity parameters is provided on the following table:

Date	Sample ID	Actual Exit Velocity (M/sec)	Maximum Allowable Velocity (M/sec)
03/12/2014	CWH-1	9.33	22.79
03/12/2014	CWH-2	9.94	23.07
03/12/2014	CWH-3	9.05	23.30
<i>Average</i>		<i>9.44</i>	<i>23.05</i>
09/03/2014	CWH-1	6.91	27.07
09/03/2014	CWH-2	6.93	27.34
09/03/2014	CWH-3	8.67	27.07
<i>Average</i>		<i>7.51</i>	<i>27.16</i>

APPENDIX A

FIELD LOGS

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

VISIBLE EMISSIONS INSPECTION - METHOD 22

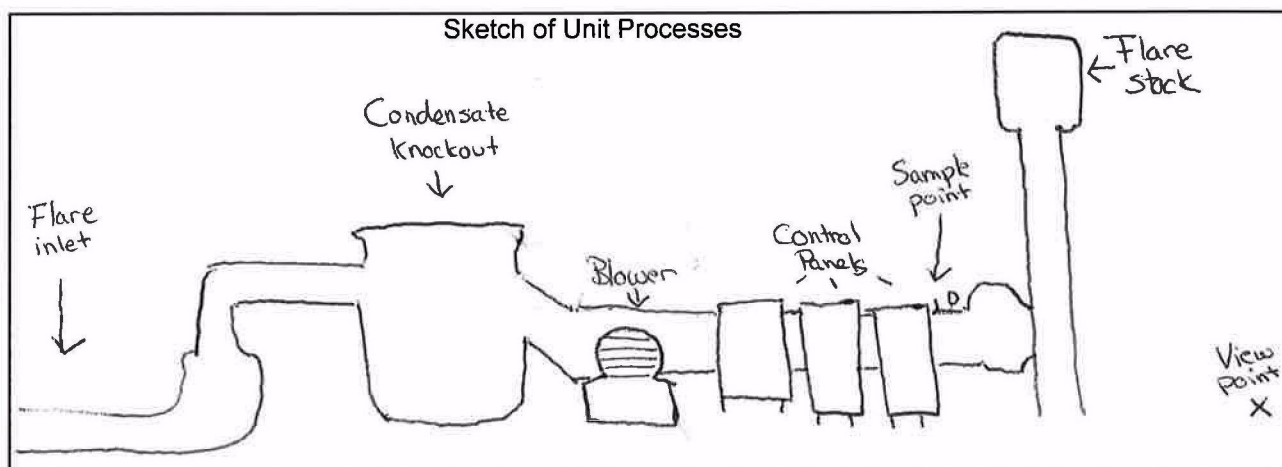
Cottonwood Hills Recycling and Disposal Facility
Marissa, Illinois

Tester Frank Barthol

Date 9/3/2014

Time (Hour:Min.)	Elapsed Time (Minutes)	Accumulate Emissions (Min.:Sec.)	Time (Hour:Min.)	Elapsed Time (Minutes)	Accumulate Emissions (Min.:Sec.)
12:50	0	----	14:05	60	----
12:55	5	0.00	14:10	65	0.00
13:00	10	0.00	14:15	70	0.00
13:05	15	0.00	14:20	75	0.00
13:10	20	0.00	14:25	80	0.00
13:15	20	----	14:30	80	----
13:20	25	0.00	14:35	85	0.00
13:25	30	0.00	14:40	90	0.00
13:30	35	0.00	14:45	95	0.00
13:35	40	0.00	14:50	100	0.00
13:40	40	----	14:55	100	----
13:45	45	0.00	15:00	105	0.00
13:50	50	0.00	15:05	110	0.00
13:55	55	0.00	15:10	115	0.00
14:00	60	0.00	15:15	120	0.00
First Hour Subtotal:		0:00	Second Hour Subtotal:		0:00
Total Visible Emissions:				0:00	

Notes:



WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 1

Vessel I.D. SC00390 Flow Controller ID AVG02557

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1085 Deg. F

Gas Temp.** 94 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 4 Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 13:40

Flow Rate* 1451 SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum -16 Inches Hg

Final Vacuum -1.5 Inches Hg

Start Time 1333

End Time 1341

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 2

Vessel I.D. SC01753 Flow Controller ID AVG03815

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1114 Deg. F

Gas Temp.** 94 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.5 Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 14:13

Flow Rate* 1546 SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum -19 Inches Hg

Final Vacuum -1.5 Inches Hg

Start Time 1415

End Time 1427

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 3

Vessel I.D. SC01689 Flow Controller ID AVG03623

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1164 Deg. F

Gas Temp.** 93 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.5 Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 14:29

Flow Rate* 1407 SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum -18 Inches Hg

Final Vacuum -1.5 Inches Hg

Start Time 1430

End Time 1441

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 4

Vessel I.D. 90675-62574

Vessel Vol. 1.0

Flow Controller ID NA
liter

Temperature Measurements

Flare Temp.* 1029 Deg. F

Gas Temp.** 94 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.5 Inches H2O

* Measured with inline Gauge

Flow Rate Record

Time 14:42

Flow Rate* 1418

SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 5

Vessel I.D. 90675-63564

Vessel Vol. 1.0

Flow Controller ID NA
liter

Temperature Measurements

Flare Temp.* 1066 Deg. F

Gas Temp.** 94 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.5 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #

Flow Rate Record

Time 14:52

Flow Rate* 1414 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Jacob Allen

Date 3/12/2014

Sample I.D. CWH- 6

Vessel I.D. 90675-62575 Flow Controller I/L NA

Vessel Vol. 1.0 liter

Temperature Measurements

Flare Temp.* 12221 Deg. F

Gas Temp.** 94 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.5 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #M00577

Flow Rate Record

Time 15:02

Flow Rate* 1412 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 1

Vessel I.D. SSC00258

Vessel Vol. 6.0

Flow Controller ID SOA00024
liter

Temperature Measurements

Flare Temp.* 1494 Deg. F

Gas Temp.** 128 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with inline Gauge

Flow Rate Record

Time 12:55

Flow Rate* 1075 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 2

Vessel I.D. SSC00223 Flow Controller ID SOA00144

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1425 Deg. F

Gas Temp.** 128 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #1

Flow Rate Record

Time 13:19

Flow Rate* 1078 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 3

Vessel I.D. SSC0072 Flow Controller ID SOA00015

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1457 Deg. F

Gas Temp.** 129 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860

Flow Rate Record

Time 13:34

Flow Rate* 1349 SCFM

*Recorded from continuous flowmeter

APPENDIX B

LABORATORY ANALYTICAL RESULTS



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

March 26, 2014

Andy Limmer
Weaver Boos Consultants
1604 Eastport Plaza Drive, Suite 104
Collinsville, IL 62234

RE: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on March 13, 2014. For your reference, these analyses have been assigned our service request number P1400981.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 4:12 pm, Mar 26, 2014

Sue Anderson
Project Manager

RIGHT SOLUTIONS | RIGHT PARTNER



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

Service Request No: P1400981

CASE NARRATIVE

The samples were received intact under chain of custody on March 13, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for twenty sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjilabs.com/search-accredited-labs	L11-203
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	494864
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Weaver Boos Consultants
Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

Service Request: P1400981

Date Received: 3/13/2014
Time Received: 10:00

ASTM D5504-01 - Sulfur Bag

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
CWH-4	P1400981-001	Air	3/12/2014	14:42	X
CWH-5	P1400981-002	Air	3/12/2014	14:52	X
CWH-6	P1400981-003	Air	3/12/2014	15:02	X

ALS Environmental
Sample Acceptance Check Form

Client: Weaver Boos Consultants

Work order: P1400981

Project: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

Sample(s) received on: 3/13/14

Date opened: 3/13/14

by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a trip blank received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1400981-001.01	1 L Zefon Bag					
P1400981-002.01	1 L Zefon Bag					
P1400981-003.01	1 L Zefon Bag					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-4

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

ALS Project ID: P1400981

ALS Sample ID: P1400981-001

Test Code: ASTM D 5504-08

Instrument ID: Agilent 6890A/GC13/SCD

Analyst: Mike Conejo

Sample Type: 1 L Zefon Bag

Test Notes:

Date Collected: 3/12/14

Time Collected: 14:42

Date Received: 3/13/14

Date Analyzed: 3/13/14

Time Analyzed: 11:52

Volume(s) Analyzed: 0.030 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	840,000	230	600,000	170	
463-58-1	Carbonyl Sulfide	3,400	410	1,400	170	
74-93-1	Methyl Mercaptan	16,000	330	8,200	170	
75-08-1	Ethyl Mercaptan	ND	420	ND	170	
75-18-3	Dimethyl Sulfide	15,000	420	6,000	170	
75-15-0	Carbon Disulfide	2,300	260	750	83	
75-33-2	Isopropyl Mercaptan	10,000	520	3,300	170	
75-66-1	tert-Butyl Mercaptan	ND	610	ND	170	
107-03-9	n-Propyl Mercaptan	ND	520	ND	170	
624-89-5	Ethyl Methyl Sulfide	ND	520	ND	170	
110-02-1	Thiophene	8,000	570	2,300	170	
513-44-0	Isobutyl Mercaptan	ND	610	ND	170	
352-93-2	Diethyl Sulfide	ND	610	ND	170	
109-79-5	n-Butyl Mercaptan	ND	610	ND	170	
624-92-0	Dimethyl Disulfide	ND	320	ND	83	
616-44-4	3-Methylthiophene	ND	670	ND	170	
110-01-0	Tetrahydrothiophene	ND	600	ND	170	
638-02-8	2,5-Dimethylthiophene	ND	760	ND	170	
872-55-9	2-Ethylthiophene	ND	760	ND	170	
110-81-6	Diethyl Disulfide	ND	420	ND	83	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-5

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

ALS Project ID: P1400981

ALS Sample ID: P1400981-002

Test Code: ASTM D 5504-08

Instrument ID: Agilent 6890A/GC13/SCD

Analyst: Mike Conejo

Sample Type: 1 L Zefon Bag

Test Notes:

Date Collected: 3/12/14

Time Collected: 14:52

Date Received: 3/13/14

Date Analyzed: 3/13/14

Time Analyzed: 11:32

Volume(s) Analyzed: 0.030 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	760,000	230	540,000	170	
463-58-1	Carbonyl Sulfide	3,100	410	1,300	170	
74-93-1	Methyl Mercaptan	15,000	330	7,400	170	
75-08-1	Ethyl Mercaptan	ND	420	ND	170	
75-18-3	Dimethyl Sulfide	14,000	420	5,700	170	
75-15-0	Carbon Disulfide	2,300	260	740	83	
75-33-2	Isopropyl Mercaptan	8,800	520	2,800	170	
75-66-1	tert-Butyl Mercaptan	ND	610	ND	170	
107-03-9	n-Propyl Mercaptan	ND	520	ND	170	
624-89-5	Ethyl Methyl Sulfide	ND	520	ND	170	
110-02-1	Thiophene	7,000	570	2,000	170	
513-44-0	Isobutyl Mercaptan	ND	610	ND	170	
352-93-2	Diethyl Sulfide	ND	610	ND	170	
109-79-5	n-Butyl Mercaptan	ND	610	ND	170	
624-92-0	Dimethyl Disulfide	ND	320	ND	83	
616-44-4	3-Methylthiophene	ND	670	ND	170	
110-01-0	Tetrahydrothiophene	ND	600	ND	170	
638-02-8	2,5-Dimethylthiophene	ND	760	ND	170	
872-55-9	2-Ethylthiophene	ND	760	ND	170	
110-81-6	Diethyl Disulfide	ND	420	ND	83	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-6

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

ALS Project ID: P1400981

ALS Sample ID: P1400981-003

Test Code: ASTM D 5504-08

Instrument ID: Agilent 6890A/GC13/SCD

Analyst: Mike Conejo

Sample Type: 1 L Zefon Bag

Test Notes:

Date Collected: 3/12/14

Time Collected: 15:02

Date Received: 3/13/14

Date Analyzed: 3/13/14

Time Analyzed: 11:12

Volume(s) Analyzed: 0.030 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	810,000	230	580,000	170	
463-58-1	Carbonyl Sulfide	3,200	410	1,300	170	
74-93-1	Methyl Mercaptan	16,000	330	7,900	170	
75-08-1	Ethyl Mercaptan	ND	420	ND	170	
75-18-3	Dimethyl Sulfide	16,000	420	6,500	170	
75-15-0	Carbon Disulfide	2,800	260	890	83	
75-33-2	Isopropyl Mercaptan	10,000	520	3,200	170	
75-66-1	tert-Butyl Mercaptan	ND	610	ND	170	
107-03-9	n-Propyl Mercaptan	ND	520	ND	170	
624-89-5	Ethyl Methyl Sulfide	ND	520	ND	170	
110-02-1	Thiophene	9,200	570	2,700	170	
513-44-0	Isobutyl Mercaptan	ND	610	ND	170	
352-93-2	Diethyl Sulfide	ND	610	ND	170	
109-79-5	n-Butyl Mercaptan	ND	610	ND	170	
624-92-0	Dimethyl Disulfide	ND	320	ND	83	
616-44-4	3-Methylthiophene	ND	670	ND	170	
110-01-0	Tetrahydrothiophene	ND	600	ND	170	
638-02-8	2,5-Dimethylthiophene	ND	760	ND	170	
872-55-9	2-Ethylthiophene	ND	760	ND	170	
110-81-6	Diethyl Disulfide	ND	420	ND	83	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Method Blank

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

ALS Project ID: P1400981

ALS Sample ID: P140313-MB

Test Code: ASTM D 5504-08

Instrument ID: Agilent 6890A/GC13/SCD

Analyst: Mike Conejo

Sample Type: 1 L Zefon Bag

Test Notes:

Date Collected: NA

Time Collected: NA

Date Received: NA

Date Analyzed: 3/13/14

Time Analyzed: 08:35

Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Lab Control Sample
Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-03

ALS Project ID: P1400981
ALS Sample ID: P140313-LCS

Test Code: ASTM D 5504-08
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 1 L Zefon Bag
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 3/13/14
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
7783-06-4	Hydrogen Sulfide	2,050	1,770	86	66-131	
463-58-1	Carbonyl Sulfide	2,020	1,720	85	64-131	
74-93-1	Methyl Mercaptan	1,890	1,860	98	68-160	



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

March 28, 2014

Andy Limmer
Weaver Boos Consultants
1604 Eastport Plaza Drive, Suite 104
Collinsville, IL 62234

RE: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on March 14, 2014. For your reference, these analyses have been assigned our service request number P1401033.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 10:41 am, Mar 28, 2014

Sue Anderson
Project Manager



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

Service Request No: P1401033

CASE NARRATIVE

The samples were received intact under chain of custody on March 14, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results.

C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C₂ through >C₆ hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID).

Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D 1946 using a gas chromatograph equipped with a thermal conductivity detector (TCD).

Hydrogen Sulfide Analysis

The samples were also analyzed for hydrogen sulfide per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD).

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

RIGHT SOLUTIONS | RIGHT PARTNER



2655 Park Center Dr., Suite A
 Simi Valley, CA 93065
 T: +1 805 526 7161
 F: +1 805 526 7270
www.alsglobal.com

ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjilabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Weaver Boos Consultants
 Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

Service Request: P1401033

Date Received: 3/14/2014
 Time Received: 09:50

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)				
								TO-3 Modified - C1C6+ Can	3C Modified - Fxd Gases Can	ASTM D5504-01 - H2S Can	25C Modified - TGNMO+ 1X Can
CWH-1	P1401033-001	Air	3/12/2014	13:33	SC00390	-0.92	3.15	X	X	X	X
CWH-2	P1401033-002	Air	3/12/2014	14:15	SC01753	0.43	2.64	X	X	X	X
CWH-3	P1401033-003	Air	3/12/2014	14:30	SC01689	-0.05	2.37	X	X	X	X



Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No
91401033

Company Name & Address (Reporting Information) Weaver Boos Consulting 1604 Eastport Plaza Dr. Suite 104 Collinsville, IL 62234				Project Name Cottonwood Hills Flare Gas Sample				ALS Contact:		Analysis Method ASTM D3588 Heating Valve MMOC EPA 75C other EPA 3C/10-3	Comments e.g. Actual Preservative or specific instructions
				Project Number 0086-440-10-3				P.O. # / Billing Information			
Project Manager Andy Limmer				Sampler (Print & Sign) Jacob Allen <i>[Signature]</i>				Email Address for Result Reporting alimmer@weaverboos.com			
Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume (L)			
CWH-1	D-092	3/12/14	1333	SC00390	AVG02557	-16	-1.5	6.0			
CWH-2	D-040	3/12/14	1415	SC01753	AVG03815	-19	-1.5	6.0			
CWH-3	D-000	3/12/14	1430	SC01689	AVG03623	-18	-1.5	6.0			
Report Tier Levels - please select										Project Requirements (MRLs, QAPP)	
Tier I - Results (Default in not specified) _____				Tier III (Results + QC & Calibration Summaries) _____				Tier II (Results + QC Summaries) _____		Tier IV (Date Validation Package) 10% Surcharge _____	
Relinquished by: (Signature) <i>[Signature]</i>				Date: 3/12/14 Time: 1611		Received by: (Signature) <i>[Signature]</i>				Date: 3/14/14 Time: 0950	
Relinquished by: (Signature)				Date: Time:		Received by: (Signature)				Date: Time: Cooler / Blank Temperature _____ °C	

5 of 16

WM00822

ALS Environmental **Sample Acceptance Check Form**

Client: Weaver Boos Consultants

Work order: P1401033

Project: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

Sample(s) received on: 3/14/14

Date opened: 3/14/14

by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a trip blank received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1401033-001.01	6.0 L Source Can					
P1401033-002.01	6.0 L Source Can					
P1401033-003.01	6.0 L Source Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-1

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P1401033-001

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Container ID: SC00390

Date Collected: 3/12/14

Date Received: 3/14/14

Components	Result Volume %	Canister Dilution Factor: 2.39	
		Result Weight %	Data Qualifier
Hydrogen	0.46	0.03	
Oxygen + Argon	4.48	5.11	
Nitrogen	20.32	20.25	
Carbon Monoxide	< 0.01	< 0.01	
Methane	42.73	24.39	
Carbon Dioxide	31.93	50.02	
Hydrogen Sulfide	0.02	0.03	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.01	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.03	0.12	
TOTALS	99.99	99.99	

Components	Mole %	Weight %
Carbon	20.75	32.04
Hydrogen	47.81	6.19
Oxygen + Argon	20.17	41.48
Nitrogen	11.25	20.26
Sulfur	< 0.10	< 0.10

Specific Gravity (Air = 1)		0.9702
Specific Volume	ft ³ /lb	13.51
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	436.8
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	393.2
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	428.2
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	385.5
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	5,898.5
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	5,310.8
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9977

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-2

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P1401033-002

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Container ID: SC01753

Date Collected: 3/12/14

Date Received: 3/14/14

		Canister Dilution Factor: 1.96	
Components	Result Volume %	Result Weight %	Data Qualifier
Hydrogen	0.43	0.03	
Oxygen + Argon	4.32	4.92	
Nitrogen	19.75	19.70	
Carbon Monoxide	< 0.01	< 0.01	
Methane	43.16	24.64	
Carbon Dioxide	32.22	50.48	
Hydrogen Sulfide	0.06	0.07	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.02	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.03	0.10	
TOTALS	99.99	99.99	
Components	Mole %	Weight %	
Carbon	20.85	32.34	
Hydrogen	48.08	6.26	
Oxygen + Argon	20.15	41.63	
Nitrogen	10.90	19.70	
Sulfur	< 0.10	< 0.10	
Specific Gravity (Air = 1)		0.9700	
Specific Volume	ft ³ /lb	13.51	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	441.2	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	397.2	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	432.5	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	389.4	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	5,959.1	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	5,365.4	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9977	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-3

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P1401033-003

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Container ID: SC01689

Date Collected: 3/12/14

Date Received: 3/14/14

Components	Result Volume %	Canister Dilution Factor: 2.04	
		Result Weight %	Data Qualifier
Hydrogen	0.51	0.04	
Oxygen + Argon	4.20	4.79	
Nitrogen	19.19	19.15	
Carbon Monoxide	< 0.01	< 0.01	
Methane	43.57	24.91	
Carbon Dioxide	32.40	50.82	
Hydrogen Sulfide	0.06	0.07	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.02	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.04	0.15	
TOTALS	99.99	99.99	

Components	Mole %	Weight %
Carbon	20.94	32.67
Hydrogen	48.41	6.34
Oxygen + Argon	20.10	41.76
Nitrogen	10.53	19.16
Sulfur	< 0.10	< 0.10

Specific Gravity (Air = 1)		0.9689
Specific Volume	ft ³ /lb	13.52
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	446.4
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	402.0
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	437.6
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	394.0
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,037.4
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	5,436.1
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9976

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-1

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P1401033-001

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Container ID: SC00390

Date Collected: 3/12/14

Date Received: 3/14/14

Date Analyzed: 3/18/14

Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.39

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.456	0.24	
7782-44-7	Oxygen +			
7440-37-1	Argon	4.48	0.24	
7727-37-9	Nitrogen	20.3	0.24	
630-08-0	Carbon Monoxide	ND	0.24	
74-82-8	Methane	42.7	0.24	
124-38-9	Carbon Dioxide	31.9	0.24	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-2
Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033
 ALS Sample ID: P1401033-002

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Summa Canister
 Test Notes:
 Container ID: SC01753

Date Collected: 3/12/14
 Date Received: 3/14/14
 Date Analyzed: 3/18/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 1.96

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.431	0.20	
7782-44-7	Oxygen +			
7440-37-1	Argon	4.32	0.20	
7727-37-9	Nitrogen	19.8	0.20	
630-08-0	Carbon Monoxide	ND	0.20	
74-82-8	Methane	43.2	0.20	
124-38-9	Carbon Dioxide	32.2	0.20	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: CWH-3

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P1401033-003

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Container ID: SC01689

Date Collected: 3/12/14

Date Received: 3/14/14

Date Analyzed: 3/18/14

Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.04

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.506	0.20	
7782-44-7	Oxygen +			
7440-37-1	Argon	4.20	0.20	
7727-37-9	Nitrogen	19.2	0.20	
630-08-0	Carbon Monoxide	ND	0.20	
74-82-8	Methane	43.6	0.20	
124-38-9	Carbon Dioxide	32.4	0.20	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Method Blank

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P140318-MB

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 3/18/14

Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Lab Control Sample

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P140318-LCS

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Summa Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 3/18/14

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
1333-74-0	Hydrogen	40,000	36,700	92	84-110	
7782-44-7	Oxygen +					
7440-37-1	Argon	50,000	50,600	101	88-114	
7727-37-9	Nitrogen	50,000	51,500	103	88-114	
630-08-0	Carbon Monoxide	50,000	49,900	100	88-113	
74-82-8	Methane	40,000	39,000	98	87-110	
124-38-9	Carbon Dioxide	50,000	49,400	99	84-109	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Wade Henton

Sampling Media: 6.0 L Summa Canister(s)

Test Notes:

Date(s) Collected: 3/12/14

Date Received: 3/14/14

Date Analyzed: 3/17/14

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
CWH-1	P1401033-001	2.39	0.50	2,200	2.4	
CWH-2	P1401033-002	1.96	0.50	2,600	2.0	
CWH-3	P1401033-003	2.04	0.50	2,900	2.0	
Method Blank	P140317-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Lab Control Sample

Client Project ID: Cottonwood Hills Flare Gas Sample / 0086-440-10-3

ALS Project ID: P1401033

ALS Sample ID: P140317-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Wade Henton

Sampling Media: 6.0 L Summa Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 3/17/14

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount	Result	% Recovery	ALS	Data
	ppmV	ppmV		Acceptance Limits	Qualifier
Total Gaseous Nonmethane Organics (TGNMO) as Methane	99.0	102	103	81-119	



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

September 18, 2014

Andy Limmer
Weaver Boos Consultants
1604 Eastport Plaza Drive, Suite 104
Collinsville, IL 62234

RE: Cottonwood Hills RDF Flare Gas Sample

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on September 4, 2014. For your reference, these analyses have been assigned our service request number P1403572.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 2:35 pm, Sep 18, 2014

Sue Anderson
Project Manager



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Cottonwood Hills RDF Flare Gas Sample

Service Request No: P1403572

CASE NARRATIVE

The samples were received intact under chain of custody on September 4, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C2 through >C6 hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID). This method is not included on the laboratory's NELAP or AIHA-LAP scope of accreditation.

Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This method is not included on the laboratory's NELAP or AIHA-LAP scope of accreditation.

Hydrogen Sulfide Analysis

The samples were also analyzed for hydrogen sulfide per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Cottonwood Hills RDF Flare Gas Sample

Service Request No: P1403572

CASE NARRATIVE

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjilabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Weaver Boos Consultants
 Project ID: Cottonwood Hills RDF Flare Gas Sample

Service Request: P1403572

Date Received: 9/4/2014
 Time Received: 07:44

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pfi (psig)					
								TO-3 Modified - C1C6+ Can	3C Modified - Fxd Gases Can	ASTM D5504-01 - H2S Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ IX Can
CWH-1	P1403572-001	Air	9/3/2014	12:53	SSC00258	-2.36	3.73	X	X	X	X	X
CWH-2	P1403572-002	Air	9/3/2014	13:17	SSC00223	-1.95	3.67	X	X	X	X	X
CWH-3	P1403572-003	Air	9/3/2014	13:34	SSC00072	-2.53	3.59	X	X	X	X	X



Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No

P1403572
~~P1403570~~

Company Name & Address (Reporting Information) Weaver Boos Consultants 1604 Eastport Plaza Drive Suite 104 Collinsville, Illinois 62234				Project Name Cottonwood Hills RDF Flare Gas Sample					ALS Contact:		Comments e.g. Actual Preservative or specific instructions
									Analysis Method		
Project Manager Andy Limmer				Project Number 0086-440-10-03					EPA 10-15 75 Cnpts 0.1ug/3+TGS +20 reduced Sulfur		
Phone (618) 830-1317				P.O. # / Billing Information							
Fax											
Email Address for Result Reporting a.limmer@weaverboos.com				Sampler (Print & Sign)							
Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume (L)			
CWH-1		9/3/14	1253	SSC00258	SOA00024	—	—	6.0	X	-2.27	
CWH-2		9/3/14	1317	SSC00223	SOA00144	—	—	6.0	X	-1.88	
CWH-3		9/3/14	1334	SSC0072	SOA00015	—	—	6.0	X	-2.73	
Report Tier Levels - please select										Project Requirements (MRLs, QAPP)	
Tier I - Results (Default in not specified)		Tier III (Results + QC & Calibration Summaries)		EDD required YES / No		Chain of Custody Seal: (Circle)					
Tier II (Results + QC Summaries)		Tier IV (Date Validation Package) 10% Surcharge		Type: _____ Units: _____		INTACT: _____ BROKEN: _____ ABSENT: _____					
Relinquished by: (Signature) <i>F. Bat</i>		Date: 9/3/14	Time: 1630	Received by: (Signature) <i>K. Kuh</i>		Date: 9/4/14	Time: 0744				
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:	Cooler / Blank Temperature °C			

6 of 25

WM00839

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/14

Sample I.D. CWH-1

Vessel I.D. SSCO0258

Vessel Vol. 60

Flow Controller ID SOA00024
liter

Temperature Measurements

Flare Temp.* 1494 Deg. F

Gas Temp.** 128 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 1255

Flow Rate* 1075

SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum Inches Hg

Final Vacuum Inches Hg

Start Time 1253

End Time 1308

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthel

Date 9/3/14

Sample I.D. CWH-2

Vessel I.D. 8SC00223

Vessel Vol. 6.0

Flow Controller ID SOA00144
liter

Temperature Measurements

Flare Temp.* 1425 Deg. F

Gas Temp.** 128 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 1319

Flow Rate* 1078 SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum Inches Hg

Final Vacuum Inches Hg

Start Time 1317

End Time 1332

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/14

Sample I.D. CWH-3

Vessel I.D. SSC0072

Vessel Vol. 6.0

Flow Controller ID 30A000015
liter

Temperature Measurements

Flare Temp.* 1457 Deg. F

Gas Temp.** 129 Deg. F

*Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* Inches H2O

* Measured with in-line Gauge

Flow Rate Record

Time 1336

Flow Rate* 1067 SCFM

*Recorded from continuous flowmeter

Summa Canister Vacuum Readings

Initial Vacuum Inches Hg

Final Vacuum Inches Hg

Start Time 1334

End Time 1349

ALS Environmental
Sample Acceptance Check Form

Client: Weaver Boos Consultants

Work order: P1403572

Project: Cottonwood Hills RDF Flare Gas Sample / 0086-440-10-03

Sample(s) received on: 9/4/14

Date opened: 9/4/14

by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a trip blank received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1403572-001.01	6.0 L Silonite Can					
P1403572-002.01	6.0 L Silonite Can					
P1403572-003.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-1
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-001

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00258

Date Collected: 9/3/14
 Date Received: 9/4/14

Components	Result Volume %	Canister Dilution Factor: 3.05	
		Result Weight %	Data Qualifier
Hydrogen	0.64	0.05	
Oxygen + Argon	2.65	3.06	
Nitrogen	13.22	13.40	
Carbon Monoxide	< 0.01	< 0.01	
Methane	48.90	28.37	
Carbon Dioxide	34.52	54.95	
Hydrogen Sulfide	0.02	0.03	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.02	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.02	0.07	
TOTALS	99.99	99.99	

Components	Mole %	Weight %
Carbon	21.89	36.33
Hydrogen	51.72	7.20
Oxygen + Argon	19.46	43.04
Nitrogen	6.93	13.41
Sulfur	< 0.10	< 0.10

Specific Gravity (Air = 1)		0.9544
Specific Volume	ft ³ /lb	13.73
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	499.3
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	449.5
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	489.3
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	440.5
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,854.8
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,171.2
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9974

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-2
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-002

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00223

Date Collected: 9/3/14
 Date Received: 9/4/14

		Canister Dilution Factor: 2.85	
Components	Result Volume %	Result Weight %	Data Qualifier
Hydrogen	0.67	0.05	
Oxygen + Argon	2.09	2.42	
Nitrogen	11.37	11.52	
Carbon Monoxide	< 0.01	< 0.01	
Methane	50.14	29.08	
Carbon Dioxide	35.62	56.68	
Hydrogen Sulfide	0.03	0.04	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.02	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.03	0.13	
TOTALS	99.99	99.99	
Components	Mole %	Weight %	
Carbon	22.23	37.39	
Hydrogen	52.40	7.40	
Oxygen + Argon	19.49	43.65	
Nitrogen	5.88	11.52	
Sulfur	< 0.10	< 0.10	
Specific Gravity (Air = 1)		0.9548	
Specific Volume	ft3/lb	13.72	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	513.2	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	462.0	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	502.8	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	452.7	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	7,041.7	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,339.8	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9973	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-3
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-003

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00072

Date Collected: 9/3/14
 Date Received: 9/4/14

		Canister Dilution Factor: 3.12	
Components	Result Volume %	Result Weight %	Data Qualifier
Hydrogen	0.65	0.05	
Oxygen + Argon	2.24	2.59	
Nitrogen	11.88	12.03	
Carbon Monoxide	< 0.01	< 0.01	
Methane	49.74	28.83	
Carbon Dioxide	35.40	56.29	
Hydrogen Sulfide	0.01	0.01	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	< 0.01	< 0.01	
C5 as n-Pentane	< 0.01	0.02	
C6 as n-Hexane	< 0.01	0.02	
> C6 as n-Hexane	0.03	0.14	
TOTALS	99.99	99.99	
Components	Mole %	Weight %	
Carbon	22.15	37.09	
Hydrogen	52.16	7.33	
Oxygen + Argon	19.52	43.54	
Nitrogen	6.16	12.03	
Sulfur	< 0.10	< 0.10	
Specific Gravity (Air = 1)		0.9556	
Specific Volume	ft3/lb	13.71	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	508.9	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	458.2	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	498.7	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	449.0	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,977.6	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,282.1	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9973	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-1
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-001

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00258

Date Collected: 9/3/14
 Date Received: 9/4/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.05

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.644	0.31	
7782-44-7	Oxygen +			
7440-37-1	Argon	2.65	0.31	
7727-37-9	Nitrogen	13.2	0.31	
630-08-0	Carbon Monoxide	ND	0.31	
74-82-8	Methane	48.9	0.31	
124-38-9	Carbon Dioxide	34.5	0.31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-2
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-002

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00223

Date Collected: 9/3/14
 Date Received: 9/4/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.85

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.674	0.29	
7782-44-7	Oxygen +			
7440-37-1	Argon	2.09	0.29	
7727-37-9	Nitrogen	11.4	0.29	
630-08-0	Carbon Monoxide	ND	0.29	
74-82-8	Methane	50.2	0.29	
124-38-9	Carbon Dioxide	35.7	0.29	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-3
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-003

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00072

Date Collected: 9/3/14
 Date Received: 9/4/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.12

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	0.655	0.31	
7782-44-7	Oxygen +			
7440-37-1	Argon	2.24	0.31	
7727-37-9	Nitrogen	11.9	0.31	
630-08-0	Carbon Monoxide	ND	0.31	
74-82-8	Methane	49.8	0.31	
124-38-9	Carbon Dioxide	35.4	0.31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Method Blank
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
ALS Sample ID: P140908-MB

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Nalini Lall
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 9/08/14
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Lab Control Sample

Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572

ALS Sample ID: P140908-LCS

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 9/08/14

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
1333-74-0	Hydrogen	40,000	38,600	97	84-110	
7782-44-7	Oxygen +					
7440-37-1	Argon	50,000	49,900	100	88-114	
7727-37-9	Nitrogen	50,000	50,900	102	88-114	
630-08-0	Carbon Monoxide	50,000	50,300	101	88-113	
74-82-8	Methane	40,000	39,400	99	87-110	
124-38-9	Carbon Dioxide	50,000	49,800	100	84-109	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-1
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-001

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00258

Date Collected: 9/3/14
 Time Collected: 12:53
 Date Received: 9/4/14
 Date Analyzed: 9/5/14
 Time Analyzed: 10:28
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.05

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	290,000	210	210,000	150	
463-58-1	Carbonyl Sulfide	2,100	370	850	150	
74-93-1	Methyl Mercaptan	7,700	300	3,900	150	
75-08-1	Ethyl Mercaptan	ND	390	ND	150	
75-18-3	Dimethyl Sulfide	14,000	390	5,700	150	
75-15-0	Carbon Disulfide	1,300	240	420	76	
75-33-2	Isopropyl Mercaptan	5,900	470	1,900	150	
75-66-1	tert-Butyl Mercaptan	ND	560	ND	150	
107-03-9	n-Propyl Mercaptan	ND	470	ND	150	
624-89-5	Ethyl Methyl Sulfide	ND	470	ND	150	
110-02-1	Thiophene	3,700	520	1,100	150	
513-44-0	Isobutyl Mercaptan	ND	560	ND	150	
352-93-2	Diethyl Sulfide	ND	560	ND	150	
109-79-5	n-Butyl Mercaptan	ND	560	ND	150	
624-92-0	Dimethyl Disulfide	ND	290	ND	76	
616-44-4	3-Methylthiophene	ND	610	ND	150	
110-01-0	Tetrahydrothiophene	ND	550	ND	150	
638-02-8	2,5-Dimethylthiophene	ND	700	ND	150	
872-55-9	2-Ethylthiophene	ND	700	ND	150	
110-81-6	Diethyl Disulfide	ND	380	ND	76	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-2
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-002

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00223

Date Collected: 9/3/14
 Time Collected: 13:17
 Date Received: 9/4/14
 Date Analyzed: 9/5/14
 Time Analyzed: 10:43
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.85

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	470,000	200	340,000	140	
463-58-1	Carbonyl Sulfide	2,400	350	970	140	
74-93-1	Methyl Mercaptan	12,000	280	6,100	140	
75-08-1	Ethyl Mercaptan	ND	360	ND	140	
75-18-3	Dimethyl Sulfide	18,000	360	7,000	140	
75-15-0	Carbon Disulfide	1,700	220	550	71	
75-33-2	Isopropyl Mercaptan	8,600	440	2,700	140	
75-66-1	tert-Butyl Mercaptan	1,400	530	390	140	
107-03-9	n-Propyl Mercaptan	ND	440	ND	140	
624-89-5	Ethyl Methyl Sulfide	ND	440	ND	140	
110-02-1	Thiophene	6,300	490	1,800	140	
513-44-0	Isobutyl Mercaptan	ND	530	ND	140	
352-93-2	Diethyl Sulfide	ND	530	ND	140	
109-79-5	n-Butyl Mercaptan	ND	530	ND	140	
624-92-0	Dimethyl Disulfide	ND	270	ND	71	
616-44-4	3-Methylthiophene	ND	570	ND	140	
110-01-0	Tetrahydrothiophene	ND	510	ND	140	
638-02-8	2,5-Dimethylthiophene	ND	650	ND	140	
872-55-9	2-Ethylthiophene	ND	650	ND	140	
110-81-6	Diethyl Disulfide	ND	360	ND	71	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: CWH-3
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P1403572-003

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00072

Date Collected: 9/3/14
 Time Collected: 13:34
 Date Received: 9/4/14
 Date Analyzed: 9/5/14
 Time Analyzed: 11:03
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.12

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	150,000	220	110,000	160	
463-58-1	Carbonyl Sulfide	2,000	380	820	160	
74-93-1	Methyl Mercaptan	5,800	310	2,900	160	
75-08-1	Ethyl Mercaptan	ND	400	ND	160	
75-18-3	Dimethyl Sulfide	13,000	400	5,000	160	
75-15-0	Carbon Disulfide	1,200	240	390	78	
75-33-2	Isopropyl Mercaptan	4,900	490	1,600	160	
75-66-1	tert-Butyl Mercaptan	ND	580	ND	160	
107-03-9	n-Propyl Mercaptan	ND	490	ND	160	
624-89-5	Ethyl Methyl Sulfide	ND	490	ND	160	
110-02-1	Thiophene	3,100	540	910	160	
513-44-0	Isobutyl Mercaptan	ND	580	ND	160	
352-93-2	Diethyl Sulfide	ND	580	ND	160	
109-79-5	n-Butyl Mercaptan	ND	580	ND	160	
624-92-0	Dimethyl Disulfide	ND	300	ND	78	
616-44-4	3-Methylthiophene	ND	630	ND	160	
110-01-0	Tetrahydrothiophene	ND	560	ND	160	
638-02-8	2,5-Dimethylthiophene	ND	720	ND	160	
872-55-9	2-Ethylthiophene	ND	720	ND	160	
110-81-6	Diethyl Disulfide	ND	390	ND	78	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Method Blank
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
 ALS Sample ID: P140905-MB

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:

Date Collected: NA
 Time Collected: NA
 Date Received: NA
 Date Analyzed: 9/05/14
 Time Analyzed: 08:00
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Lab Control Sample
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
ALS Sample ID: P140905-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 9/05/14
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
7783-06-4	Hydrogen Sulfide	2,050	1,570	77	66-131	
463-58-1	Carbonyl Sulfide	2,020	1,560	77	64-131	
74-93-1	Methyl Mercaptan	1,890	1,600	85	68-160	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified
Instrument ID: HP5890 II/GC1/FID/TCA
Analyst: Wade Henton
Sampling Media: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 9/3/14
Date Received: 9/4/14
Date Analyzed: 9/6/14

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
CWH-1	P1403572-001	3.05	0.50	3,200	3.1	
CWH-2	P1403572-002	2.85	0.50	4,400	2.9	
CWH-3	P1403572-003	3.12	0.50	4,500	3.1	
Method Blank	P140906-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Lab Control Sample
Client Project ID: Cottonwood Hills RDF Flare Gas Sample

ALS Project ID: P1403572
ALS Sample ID: P140906-LCS

Test Code: EPA Method 25C Modified
Instrument ID: HP5890 II/GC1/FID/TCA
Analyst: Wade Henton
Sampling Media: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 9/06/14
Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
				Acceptance Limits	
Total Gaseous Nonmethane Organics (TGNMO) as Methane	199	190	95	81-119	



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

September 19, 2014

Andy Limmer
Weaver Boos Consultants
1604 Eastport Plaza Drive, Suite 104
Collinsville, IL 62234

RE: Milam RDF Flare Gas Sample / 0086.317.10.05

Dear Andy:

Enclosed are the results of the samples submitted to our laboratory on September 5, 2014. For your reference, these analyses have been assigned our service request number P1403597.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 3:33 pm, Sep 19, 2014

Sue Anderson
Project Manager



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Milam RDF Flare Gas Sample / 0086.317.10.05

Service Request No: P1403597

CASE NARRATIVE

The samples were received intact under chain of custody on September 5, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C2 through >C6 hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID). This method is not included on the laboratory's NELAP or AIHA-LAP scope of accreditation.

Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This method is not included on the laboratory's NELAP or AIHA-LAP scope of accreditation.

Hydrogen Sulfide Analysis

The samples were also analyzed for hydrogen sulfide per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Weaver Boos Consultants
Project: Milam RDF Flare Gas Sample / 0086.317.10.05

Service Request No: P1403597

CASE NARRATIVE

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjilabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Weaver Boos Consultants
 Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

Service Request: P1403597

Date Received: 9/5/2014
 Time Received: 07:40

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pfi (psig)					
								TO-3 Modified - C1C6+ Can	3C Modified - Fxd Gases Can	ASTM D5504-01 - H2S Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ IX Can
MILAM-1	P1403597-001	Air	9/4/2014	12:57	SSC00207	-2.63	3.67	X	X	X	X	X
MILAM-2	P1403597-002	Air	9/4/2014	13:13	SSC00226	-2.97	3.69	X	X	X	X	X
MILAM-3	P1403597-003	Air	9/4/2014	13:30	SSC00148	-2.77	3.72	X	X	X	X	X



Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No

P1403597

Company Name & Address (Reporting Information) Weaver Boos Consultants 1604 Eastport Plaza Drive Suite 104 Collinsville, IL 62234				Project Name Milam RDF Flare Gas Sample					ALS Contact:		Comments e.g. Actual Preservative or specific instructions
									Analysis Method		
Project Manager Andy Limmer				Project Number 0086-317-10-05					EPA TO-15 (75 Cmpds 0.1ug/3 + TICs + 20 reduced Sulfurs)		
Phone (618) 830-1317				P.O. # / Billing Information							
Fax											
Email Address for Result Reporting alimmer@weaverboos.com				Sampler (Print & Sign)							
Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume (L)			
MILAM-1	①-262	9/4/14	1257	SSC0027	SOA00158	—	—	6.0	X		
MILAM-2	②-275	9/4/14	1313	SSC00226	SOA00129	—	—	6.0	X		
MILAM-3	③-275	9/4/14	1330	SSC00148	SOA00132	—	—	6.0	X		
Report Tier Levels - please select										Project Requirements (MRLs, QAPP)	
Tier I - Results (Default in not specified) _____ Tier III (Results + QC & Calibration Summaries) _____ Tier II (Results + QC Summaries) _____ Tier IV (Date Validation Package) 10% Surcharge _____											
EDD required YES / No _____ Type: _____ Units: _____										Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT	
Relinquished by: (Signature) <i>AB</i> Date: 9/4/14 Time: 1600											
Relinquished by: (Signature) _____ Date: _____ Time: _____										Cooler / Blank Temperature _____ °C	
Received by: (Signature) <i>K/K</i> Date: 9/5/14 Time: 0740											
Received by: (Signature) _____ Date: _____ Time: _____											

6 of 22

WM00864

ALS Environmental
Sample Acceptance Check Form

Client: Weaver Boos Consultants

Work order: P1403597

Project: Milam RDF Flare Gas Sample / 0086.317.10.05

Sample(s) received on: 9/5/14

Date opened: 9/5/14

by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a trip blank received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1403597-001.01	6.0 L Silonite Can					
P1403597-002.01	6.0 L Silonite Can					
P1403597-003.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO₂, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-1
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-001

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00207

Date Collected: 9/4/14
 Date Received: 9/5/14

		Canister Dilution Factor: 3.18	
Components	Result Volume %	Result Weight %	Data Qualifier
Hydrogen	< 0.01	< 0.01	
Oxygen + Argon	0.88	1.01	
Nitrogen	11.43	11.45	
Carbon Monoxide	< 0.01	< 0.01	
Methane	50.48	28.95	
Carbon Dioxide	37.16	58.47	
Hydrogen Sulfide	< 0.01	< 0.01	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	0.01	0.02	
C5 as n-Pentane	< 0.01	< 0.01	
C6 as n-Hexane	< 0.01	< 0.01	
> C6 as n-Hexane	0.02	0.07	
TOTALS	99.99	99.99	
Components	Mole %	Weight %	
Carbon	22.57	37.72	
Hydrogen	52.01	7.30	
Oxygen + Argon	19.55	43.53	
Nitrogen	5.87	11.45	
Sulfur	< 0.10	< 0.10	
Specific Gravity (Air = 1)		0.9657	
Specific Volume	ft3/lb	13.57	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	513.0	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	461.9	
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	502.6	
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	452.6	
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,960.0	
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,267.3	
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9972	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-2
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-002

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00226

Date Collected: 9/4/14
 Date Received: 9/5/14

Components	Result Volume %	Canister Dilution Factor: 3.39	
		Result Weight %	Data Qualifier
Hydrogen	< 0.01	< 0.01	
Oxygen + Argon	0.75	0.85	
Nitrogen	10.95	10.96	
Carbon Monoxide	< 0.01	< 0.01	
Methane	50.80	29.12	
Carbon Dioxide	37.45	58.91	
Hydrogen Sulfide	< 0.01	< 0.01	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	0.01	0.02	
C5 as n-Pentane	< 0.01	< 0.01	
C6 as n-Hexane	< 0.01	< 0.01	
> C6 as n-Hexane	0.02	0.10	
TOTALS	99.99	99.99	

Components	Mole %	Weight %
Carbon	22.65	38.00
Hydrogen	52.19	7.34
Oxygen + Argon	19.55	43.69
Nitrogen	5.60	10.96
Sulfur	< 0.10	< 0.10

Specific Gravity (Air = 1)		0.9660
Specific Volume	ft ³ /lb	13.56
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	516.8
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft ³	465.4
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	506.3
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft ³	456.0
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	7,009.3
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,312.0
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9972

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-3
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-003

Test Code: ASTM D3588-98
 Analyst: Mike Conejo/Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00148

Date Collected: 9/4/14
 Date Received: 9/5/14

Components	Result Volume %	Canister Dilution Factor: 3.27	
		Result Weight %	Data Qualifier
Hydrogen	< 0.01	< 0.01	
Oxygen + Argon	0.80	0.91	
Nitrogen	11.17	11.18	
Carbon Monoxide	< 0.01	< 0.01	
Methane	50.62	29.01	
Carbon Dioxide	37.36	58.75	
Hydrogen Sulfide	< 0.01	< 0.01	
C2 as Ethane	< 0.01	< 0.01	
C3 as Propane	< 0.01	< 0.01	
C4 as n-Butane	0.01	0.02	
C5 as n-Pentane	< 0.01	< 0.01	
C6 as n-Hexane	< 0.01	< 0.01	
> C6 as n-Hexane	0.02	0.09	
TOTALS	99.99	99.99	

Components	Mole %	Weight %
Carbon	22.62	37.86
Hydrogen	52.08	7.32
Oxygen + Argon	19.57	43.63
Nitrogen	5.73	11.18
Sulfur	< 0.10	< 0.10

Specific Gravity (Air = 1)		0.9662
Specific Volume	ft3/lb	13.56
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	514.8
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/ft3	463.6
Gross Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	504.4
Net Heating Value (Water Saturated at 0.25636 psia)	BTU/ft3	454.2
Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,980.5
Net Heating Value (Dry Gas @ 60 F, 14.696 psia)	BTU/lb	6,286.0
Compressibility Factor "Z" (60 F, 14.696 psia)		0.9972

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-1
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-001

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00207

Date Collected: 9/4/14
 Date Received: 9/5/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.18

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.32	
7782-44-7	Oxygen +			
7440-37-1	Argon	0.884	0.32	
7727-37-9	Nitrogen	11.4	0.32	
630-08-0	Carbon Monoxide	ND	0.32	
74-82-8	Methane	50.5	0.32	
124-38-9	Carbon Dioxide	37.2	0.32	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-2
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-002

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00226

Date Collected: 9/4/14
 Date Received: 9/5/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.39

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.34	
7782-44-7	Oxygen +			
7440-37-1	Argon	0.746	0.34	
7727-37-9	Nitrogen	11.0	0.34	
630-08-0	Carbon Monoxide	ND	0.34	
74-82-8	Methane	50.8	0.34	
124-38-9	Carbon Dioxide	37.5	0.34	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-3
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-003

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00148

Date Collected: 9/4/14
 Date Received: 9/5/14
 Date Analyzed: 9/8/14
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 3.27

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.33	
7782-44-7	Oxygen +			
7440-37-1	Argon	0.799	0.33	
7727-37-9	Nitrogen	11.2	0.33	
630-08-0	Carbon Monoxide	ND	0.33	
74-82-8	Methane	50.6	0.33	
124-38-9	Carbon Dioxide	37.4	0.33	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Method Blank
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P140908-MB

Test Code: EPA Method 3C Modified
 Instrument ID: HP5890 II/GC1/TCD
 Analyst: Nalini Lall
 Sample Type: 6.0 L Silonite Canister
 Test Notes:

Date Collected: NA
 Date Received: NA
 Date Analyzed: 9/08/14
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen +			
7440-37-1	Argon	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Lab Control Sample

Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597

ALS Sample ID: P140908-LCS

Test Code: EPA Method 3C Modified

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 9/08/14

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
1333-74-0	Hydrogen	40,000	38,600	97	84-110	
7782-44-7	Oxygen +					
7440-37-1	Argon	50,000	49,900	100	88-114	
7727-37-9	Nitrogen	50,000	50,900	102	88-114	
630-08-0	Carbon Monoxide	50,000	50,300	101	88-113	
74-82-8	Methane	40,000	39,400	99	87-110	
124-38-9	Carbon Dioxide	50,000	49,800	100	84-109	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-1
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-001

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00207

Date Collected: 9/4/14
 Time Collected: 12:57
 Date Received: 9/5/14
 Date Analyzed: 9/6/14
 Time Analyzed: 09:35
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 3.18

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	58,000	22	42,000	16	
463-58-1	Carbonyl Sulfide	440	39	180	16	
74-93-1	Methyl Mercaptan	2,300	31	1,200	16	
75-08-1	Ethyl Mercaptan	430	40	170	16	
75-18-3	Dimethyl Sulfide	3,600	40	1,400	16	
75-15-0	Carbon Disulfide	190	25	60	8.0	
75-33-2	Isopropyl Mercaptan	3,900	50	1,200	16	
75-66-1	tert-Butyl Mercaptan	1,800	59	490	16	
107-03-9	n-Propyl Mercaptan	110	50	35	16	
624-89-5	Ethyl Methyl Sulfide	ND	50	ND	16	
110-02-1	Thiophene	1,300	55	390	16	
513-44-0	Isobutyl Mercaptan	910	59	250	16	
352-93-2	Diethyl Sulfide	ND	59	ND	16	
109-79-5	n-Butyl Mercaptan	ND	59	ND	16	
624-92-0	Dimethyl Disulfide	ND	31	ND	8.0	
616-44-4	3-Methylthiophene	530	64	130	16	
110-01-0	Tetrahydrothiophene	ND	57	ND	16	
638-02-8	2,5-Dimethylthiophene	ND	73	ND	16	
872-55-9	2-Ethylthiophene	ND	73	ND	16	
110-81-6	Diethyl Disulfide	ND	40	ND	8.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-2
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-002

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00226

Date Collected: 9/4/14
 Time Collected: 13:13
 Date Received: 9/5/14
 Date Analyzed: 9/6/14
 Time Analyzed: 11:25
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 3.39

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	78,000	24	56,000	17	
463-58-1	Carbonyl Sulfide	440	42	180	17	
74-93-1	Methyl Mercaptan	2,900	33	1,500	17	
75-08-1	Ethyl Mercaptan	580	43	230	17	
75-18-3	Dimethyl Sulfide	4,600	43	1,800	17	
75-15-0	Carbon Disulfide	210	26	69	8.5	
75-33-2	Isopropyl Mercaptan	5,500	53	1,800	17	
75-66-1	tert-Butyl Mercaptan	2,500	62	670	17	
107-03-9	n-Propyl Mercaptan	160	53	51	17	
624-89-5	Ethyl Methyl Sulfide	ND	53	ND	17	
110-02-1	Thiophene	1,900	58	540	17	
513-44-0	Isobutyl Mercaptan	1,300	62	360	17	
352-93-2	Diethyl Sulfide	ND	62	ND	17	
109-79-5	n-Butyl Mercaptan	ND	62	ND	17	
624-92-0	Dimethyl Disulfide	ND	33	ND	8.5	
616-44-4	3-Methylthiophene	900	68	220	17	
110-01-0	Tetrahydrothiophene	ND	61	ND	17	
638-02-8	2,5-Dimethylthiophene	ND	78	ND	17	
872-55-9	2-Ethylthiophene	ND	78	ND	17	
110-81-6	Diethyl Disulfide	ND	42	ND	8.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: MILAM-3
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P1403597-003

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:
 Container ID: SSC00148

Date Collected: 9/4/14
 Time Collected: 13:30
 Date Received: 9/5/14
 Date Analyzed: 9/6/14
 Time Analyzed: 11:43
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 3.27

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	51,000	23	36,000	16	
463-58-1	Carbonyl Sulfide	550	40	220	16	
74-93-1	Methyl Mercaptan	2,500	32	1,300	16	
75-08-1	Ethyl Mercaptan	520	42	210	16	
75-18-3	Dimethyl Sulfide	4,100	42	1,600	16	
75-15-0	Carbon Disulfide	210	25	68	8.2	
75-33-2	Isopropyl Mercaptan	4,600	51	1,500	16	
75-66-1	tert-Butyl Mercaptan	2,200	60	600	16	
107-03-9	n-Propyl Mercaptan	140	51	45	16	
624-89-5	Ethyl Methyl Sulfide	ND	51	ND	16	
110-02-1	Thiophene	1,600	56	480	16	
513-44-0	Isobutyl Mercaptan	1,300	60	340	16	
352-93-2	Diethyl Sulfide	ND	60	ND	16	
109-79-5	n-Butyl Mercaptan	ND	60	ND	16	
624-92-0	Dimethyl Disulfide	150	31	40	8.2	
616-44-4	3-Methylthiophene	1,000	66	260	16	
110-01-0	Tetrahydrothiophene	ND	59	ND	16	
638-02-8	2,5-Dimethylthiophene	ND	75	ND	16	
872-55-9	2-Ethylthiophene	ND	75	ND	16	
110-81-6	Diethyl Disulfide	ND	41	ND	8.2	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Method Blank
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
 ALS Sample ID: P140906-MB

Test Code: ASTM D 5504-12
 Instrument ID: Agilent 6890A/GC13/SCD
 Analyst: Mike Conejo
 Sample Type: 6.0 L Silonite Canister
 Test Notes:

Date Collected: NA
 Time Collected: NA
 Date Received: NA
 Date Analyzed: 9/06/14
 Time Analyzed: 08:31
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants
Client Sample ID: Lab Control Sample
Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597
ALS Sample ID: P140906-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 9/06/14
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
7783-06-4	Hydrogen Sulfide	2,050	1,730	84	66-131	
463-58-1	Carbonyl Sulfide	2,020	1,750	87	64-131	
74-93-1	Methyl Mercaptan	1,890	1,730	92	68-160	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Weaver Boos Consultants

Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Wade Henton

Sampling Media: 6.0 L Silonite Canister(s)

Test Notes:

Date(s) Collected: 9/4/14

Date Received: 9/5/14

Date Analyzed: 9/6/14

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
MILAM-1	P1403597-001	3.18	0.50	1,800	3.2	
MILAM-2	P1403597-002	3.39	0.50	1,900	3.4	
MILAM-3	P1403597-003	3.27	0.50	2,000	3.3	
Method Blank	P140906-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Weaver Boos Consultants

Client Sample ID: Lab Control Sample

Client Project ID: Milam RDF Flare Gas Sample / 0086.317.10.05

ALS Project ID: P1403597

ALS Sample ID: P140906-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Wade Henton

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 9/06/14

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
				Acceptance Limits	
Total Gaseous Nonmethane Organics (TGNMO) as Methane	199	190	95	81-119	

APPENDIX C
CALCULATIONS

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 1	3/12/2014	
Percent Methane:		42.7	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 427000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \mathbf{14.24 \text{ MJ/scm}}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 2	3/12/2014	
Percent Methane:		43.2	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 432000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \quad \quad \quad \mathbf{14.41 \quad MJ/scm}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 3	3/12/2014	
Percent Methane:		43.6	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 436000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \mathbf{14.54 \text{ MJ/scm}}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 1	3/12/2014	13:40	
Net Heating Value	Heating Value, H(T):	14.2	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (14.2429266 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 22.8 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{74.8} \quad \mathbf{ft/sec}$$

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 2	3/12/2014		14:13
Net Heating Value	Heating Value, H(T):	14.4	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (14.4097056 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 23.1 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{75.7} \quad \mathbf{ft/sec}$$

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 3	3/12/2014	14:29	
Net Heating Value	Heating Value, H(T):	14.5	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (14.5431288 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 23.3 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{76.4 \quad ft/sec}$$

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 1

Vessel I.D. SSC00258 Flow Controller ID SOA00024

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1494 Deg. F

Gas Temp.** 128 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with inline Gauge

Flow Rate Record

Time 12:55

Flow Rate* 1075 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 2

Vessel I.D. SSC00223 Flow Controller ID SOA00144

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1425 Deg. F

Gas Temp.** 128 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #1

Flow Rate Record

Time 13:19

Flow Rate* 1078 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Sampler Frank Barthol

Date 9/3/2014

Sample I.D. CWH- 3

Vessel I.D. SSC0072 Flow Controller ID SOA00015

Vessel Vol. 6.0 liter

Temperature Measurements

Flare Temp.* 1457 Deg. F

Gas Temp.** 129 Deg. F

* Recorded From Flare Chart Recorder

** Measured with in-line thermometer

Pressure Measurement

Static Pressure* 2.4 Inches H2O

* Measured with Shortridge Instruments, Inc. Airdata Multimeter ADM 860 #M00577

Flow Rate Record

Time 13:34

Flow Rate* 1349 SCFM

*Recorded from continuous flowmeter

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 1	9/3/2014	12:55
Percent Methane:		48.9	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 489000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \mathbf{16.31 \text{ MJ/scm}}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 2	9/3/2014	13:19
Percent Methane:		50.2	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 502000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \quad \quad \quad \mathbf{16.74 \quad MJ/scm}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

NET HEATING VALUE CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Input

Sample No.	CWH- 3	9/3/2014	13:34
Percent Methane:		49.8	Percent
Net heat of combustion of methane*		802	KJ/g mole

Net Heating Value calculated using the following equation:

$$HT = K \sum C_i H_i$$

where:

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg

K: 1.740×10^{-7} (1/ppm)(g mole/scm)(MJ/kcal)

where (g mole/scm) is at 20 deg. C

C_i : concentration of component sample component i in ppm

H_i : net heat of combustion for sample component i
in (kcal/g mole) at 25 deg. C, 760 mm Hg

Convert Heat of Combustion from Btu/scf to kcal/g mole

A) KJ/mol to J/mol

$$(802 \text{ kJ/g mole}) \times (1000 \text{ J/1 kJ}) = 802,000 \text{ J/g mole}$$

B) J/mole to cal/mole

$$(802,000 \text{ J/g mole}) \times (1 \text{ cal/4.184 J}) = 191,682.6 \text{ cal/g mole}$$

C) cal/mole to Kcal/mole

$$(191,682 \text{ cal/g mole}) \times (1 \text{ Kcal/1000 cal}) = 191.7 \text{ kcal/g mole}$$

Now calculate Net Heating Value

$$HT = K \sum C_i H_i$$

$$H (T) = 1.740 \times 10^{-7} (1/\text{ppm})(\text{g mole/scm})(\text{MJ/kcal}) \times 498000 \text{ ppm} \times 191.7 \text{ kcal/g-mole}$$

$$H (T) = \quad \quad \quad \mathbf{16.61 \quad MJ/scm}$$

* Value from *Chemistry: The Central Science 2nd Edition*, by Theodore L. Brown and H. Eugene LeMay, Jr.

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Flare Tip Diameter (in)	12
-------------------------	----

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 1	9/3/2014	12:55	
Net Heating Value	Heating Value, H(T):	16.6	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (16.6111884 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 27.1 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{88.8} \quad \mathbf{ft/sec}$$

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 2	9/3/2014	13:19	
Net Heating Value	Heating Value, H(T):	16.7	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (16.7446116 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 27.3 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{89.7} \quad \mathbf{ft/sec}$$

WEAVER BOOS CONSULTANTS

LANDFILL GAS FLARE TESTING LOG

MAXIMUM PERMITTED EXIT VELOCITY CALCULATIONS

Waste Management, Inc.
Cottonwood Hills Recycling and Disposal Facility
Marissa, IL

Maximum permitted exit velocity calculated using the following equation:

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

where:

$V_{(\text{max})}$: Maximum permitted exit velocity, m/sec

28.8: Constant

31.7: Constant

H (T): Net Heating Value in (MJ/scm) at 25 deg. C, 760 mm Hg as determined from 40 CFR 60.18(f)(3)

Sample No.	CWH- 3	9/3/2014	13:34	
Net Heating Value	Heating Value, H(T):	16.6	MJ/scm	at 25 deg. C and 760 mm Hg

$$\text{Log (10) } (V_{(\text{max})}) = (H(T) + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = (16.6111884 + 28.8)/31.7$$

$$\text{Log (10) } (V_{(\text{max})}) = 1.4$$

$$V_{(\text{max})} = 27.1 \quad \text{m/sec}$$

$$V_{(\text{max})} = \mathbf{88.8} \quad \mathbf{ft/sec}$$